



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,925	01/16/2004	Kiyoshi Satoh	ASMJP.055C1	8224
20995	7590	03/15/2005	EXAMINER	
KNOBBE MARTENS OLSON & BEAR LLP			KORNAKOV, MICHAEL	
2040 MAIN STREET			ART UNIT	
FOURTEENTH FLOOR			PAPER NUMBER	
IRVINE, CA 92614			1746	

DATE MAILED: 03/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/759,925

**Applicant(s)**

SATO ET AL.

**Examiner**

Michael Kornakov

**Art Unit**

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 December 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 15-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 15-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 10/13/2004.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

re

## **DETAILED ACTION**

### ***Terminal Disclaimer***

1. The terminal disclaimer filed on 12/23/2004 disclaiming the terminal portion of any patent granted on this application, which would extend beyond the expiration date of U.S. Patent No. 6,736,147 has been reviewed and is accepted. The terminal disclaimer has been recorded.
2. Amendment to claims 1,6,10,12,15 and 21 and cancellation of claims 13 and 14 in Applicants' reply dated 12/23/2004 are noted. Applicants' amendment has overcome Double Patenting rejection, objections to the specification and drawings, rejection of claims 10 and 21 under 35 U.S.C. 112, second paragraph, rejection of claims 1-3,6,12-17 under 35 U.S.C. 102(b) over EP 0697467 and the indicated objections and rejections are withdrawn.
3. Claims 1-12,15-22 are examined on the merits.
4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
5. Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 22 recites the limitation "the adhered silicon nitride deposits". There is insufficient antecedent basis for this limitation in the claim.

Art Unit: 1746

6. Claims 1-8, 12, 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0697467.

7. Claims 1-3, 5, 6, 8, 12, 15-18 are rejected over the embodiment of EP'467, which teaches a method for cleaning a CVD deposition chamber comprising the steps of : a) delivering a precursor cleaning gas, such as  $\text{NF}_3$  or  $\text{CH}_4$  into a remote chamber that is outside the deposition chamber; b) activating the precursor gas in the remote chamber to form reactive species, utilizing **microwave** source of energy with a power about 500-1500 W c) flowing the reactive species from the remote chamber into the deposition chamber through a piping; d) removing adhered deposits from the inside surfaces of the deposition chamber, wherein the removal rate ranges from 1micron/minute to 2 micron/minute depending on particular deposit to be removed and wherein the said deposits include silicon nitride, silicon oxide, tungsten (col.2, lines 37-47; col.5, lines 11-18; col.6, lines 11-15, 26-30, 47-56; col.7, lines 1-3).

Regarding the specific limitation of claims 1 and 6, which are concerned with deposits removal rate **greater** than 2.0 microns/minute, since the bounds of term "greater" are not specifically recited, such bounds are interpreted as having a minute difference compare to the removal rate of EP'467, Applicants' attention is drawn to the fact that a prima facie case of obviousness exists when the claimed range and the prior art range do not overlap, but are close enough, such that one skilled in the art would have expected them to have the same properties, consult *In Re Titanium Metals Corp. v. Banner*, 778 F.2d 775,783,227 USPQ 773,779 (Fed. Cir. 1985).

Regarding the specific limitation of claim 12, which is concerned with silicon oxide deposits removal rate being **greater** than or equal to about 1.5 microns/minute, EP'467 teaches that the optimum of performance of a particular system can be regulated by appropriate adjustments in process conditions, which is well within the capabilities of a person of ordinary skill in the art (paragraph, bridging col. 7 and 8). Therefore, one skilled in the art, motivated by EP'467, would have found obvious to adjust the processing conditions in order to accelerate removal of silicon oxide deposits while cleaning the CVD chamber of EP'467, thus increasing the output of CVD chamber.

The teaching of EP'467 also differs from the instant claims 5 and 18 by not specifically indicating the flow rate of  $\text{NF}_3$  as being between 0.5 slm and 1.5 slm and by not limiting the applied energy power to the range of between about 2,500 W and 3,000 W, while utilizing microwave activation source. However, EP'467 indicates that the gas flow rate and the energy power are result effective parameters by stating that "the power levels, flow rates and the other processing parameters that are chosen, are system specific and thus they will need to be optimized for the particular system, in which the process is being run. Making the appropriate adjustments in process conditions to achieve optimum of performance for a particular system is well within the capabilities of a person of ordinary skill in the art" (paragraph, bridging col. 7 and 8). Therefore, one skilled in the art motivated by EP'467 would have found obvious to optimize the processing parameters in order to accelerate removal of deposits from CVD chamber in the method of EP'467 with the reasonable expectation of success.

Furthermore, it is well settled that discovery of optimum value of result effective variable in known process is ordinarily within the skill in the art and would have been obvious, consult *In re* Boesch and Slaney 205 USPQ 215 (CCPA 1980).

8. Claims 1, 4, 6, 7, 12, 19 are rejected over the embodiment of EP'467, which teaches a method for cleaning a CVD deposition chamber with the steps as recited above, except that activating the precursor gas in the remote chamber is performed utilizing **RF** power source, operating at 400kHz (col.6, line 40; col.7, lines 50-51). EP'467 remains silent about the value of power, utilized during the application of RF frequency. However, EP'467 indicates that the energy power is a result effective parameter by stating that "the power levels and the other processing parameters that are chosen, are system specific and thus they will need to be optimized for the particular system, in which the process is being run. Making the appropriate adjustments in process conditions to achieve optimum of performance for a particular system is well within the capabilities of a person of ordinary skill in the art" (paragraph, bridging col. 7 and 8). Therefore, one skilled in the art motivated by EP'467 would have found obvious to optimize the RF power in order to accelerate removal of deposits from CVD chamber in the method of EP'467 with the reasonable expectation of success. It is also well settled that discovery of optimum value of result effective variable in known process is ordinarily within the skill in the art and would have been obvious, consult *In re* Boesch and Slaney 205 USPQ 215 (CCPA 1980). Furthermore, the RF power of 2,000W is conventionally utilized in the art, as indicated by EP'467 with regard to local

Art Unit: 1746

RF plasma source. Therefore, one skilled in the art would have found obvious to utilize 2,000W of power in order to activate the precursor gas in the remote chamber utilizing RF power source in the method of EP'467 with the reasonable expectation of success.

As to the specific limitation of claims 1 and 6, which are concerned with deposits removal rate **greater** than 2.0 microns/minute and to the specific limitation of claim 12, which is concerned with silicon oxide deposits removal rate of **greater** than or equal to about 1.5 microns/minute, these limitations are discussed above with regard to the other embodiment of EP'467 and the rationale of this discussion is fully incorporated here.

9. Claims 9-11 and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0697467 in view of Rajagopalan et al (U.S. 6,274,058)

The teaching of EP'467 remains silent about a valve, positioned on the piping and about the steps of operating the valve during the cleaning procedure. However, the on/off valves are conventionally utilized in the art in order to isolate the remote plasma environment from the processing chamber. Such isolation allows to maintain the plasma remote, while running the processing task in the chamber. Thus, Rajagopalan teaches remote plasma cleaning method for processing chambers, wherein an on/off valve 90 is utilized in order to continue operation of remote plasma generator while not requiring that reactive species be provided to the processing chamber 10. Once the valve 90 is open, the cleaning gas ( $\text{NF}_3$ ) reactive species from remote plasma generator 60 flow through gas supply line into the chamber interior (col.6, lines 35-44). Rajagopalan also provides a cleaning routine, wherein after forming deposits within the processing

chamber and removing processed substrates from the chamber a plasma in the remote plasma apparatus is initiated and reactive species flow into the processing chamber through supply line 88 passing the opened valve 90.

Because both EP'467 and Rajagopalan are concerned with processing chamber cleaning, utilizing remote plasma source and Rajagopalan provides benefits of utilizing on/off valve positioned on the piping, connecting remote plasma source with processing chamber, one skilled in the art motivated by Rajagopalan would have found obvious to utilize such valve in order to establish remote cleaning plasma environment while still running CVD processing, thus increasing chamber processing output in the method of EP'467 with the reasonable expectation of success.

Regarding the specific limitation of claims 10 and 21, which is concerned with forming an opening in a path, substantially as wide as internal surfaces of the piping the skilled artisan would have found obvious to form such opening utilizing the on/off valve in order to provide fast release of reactive species into the processing chamber of EP'467/ Rajagopalan, thus enhancing and accelerating its cleaning with the reasonable expectation of success.

Regarding the specific limitation of claims 10 and 21, which is concerned with withdrawing a valve body, it is noticed here that the valve body represents a structural limitation of the valve. It is noted here that the recitation of specific structural limitations of apparatus in process claim for performing processing steps, wherein the structural limitations of apparatus do not present manipulative difference between the claimed



Art Unit: 1746

process steps and the prior art process, do not serve to limit the claim. See, e.g., In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

### ***Response to Arguments***

10. Applicant's arguments with respect to claims 1-8,12,15-19 have been considered but are moot in view of the new ground(s) of rejection.

11. Applicant's arguments with respect to claims 9-11 and 20-22 have been fully considered but they are not persuasive. Applicants argue that Rajagopalan does not teach removing adhered silicon nitride deposits from CVD reactions on a wall of the reaction chamber at a rate of greater than 2.0 microns/minute." (Claim 6) Rajagopalan does not provide silicon nitride etch rates exceeding 2.0 microns/minute. Rajagopalan also does not teach removing adhered silicon oxide deposits from CVD reactions on a wall of the reaction chamber at a rate of greater than or equal to about 1.5 microns/minute." (Claim 12). Rajagopalan teaches cleaning rates for silicon oxide lower than 1.5 microns per minute. With regard to these arguments it should be pointed out here that the reference to Rajagopalan was provided in order to remedy deficiencies of EP'467 regarding the use of a valve on the piping but not to disclose the limitations, which are addressed by the primary reference to EP'467.

### ***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

Art Unit: 1746

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

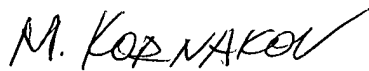
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (571) 272-1303. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on (571) 272-1414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1746

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "M. Kornakov", with a long, sweeping horizontal stroke extending to the right.

Michael Kornakov  
Primary Examiner  
Art Unit 1746

03/11/2005